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Hantavirus Pulmonary Syndrome

Overview ^(1, 2)

For a more complete description of hantavirus pulmonary syndrome, refer to the following texts:

- Control of Communicable Diseases Manual (CCDM).
- Red Book, Report of the Committee on Infectious Diseases.

Case Definition ⁽³⁾

Clinical description

Hantavirus pulmonary syndrome (HPS), commonly referred to as hantavirus disease, is a febrile illness characterized by bilateral interstitial pulmonary infiltrates and respiratory compromise usually requiring supplemental oxygen and clinically resembling acute respiratory disease syndrome (ARDS). The typical prodrome consists of fever, chills, myalgia, headache, and gastrointestinal symptoms. Typical clinical laboratory findings include hemoconcentration, left shift in the white blood cell count, neutrophilic leukocytosis, thrombocytopenia, and circulating immunoblasts.


Clinical case definition

An illness characterized by one or more of the following clinical features:

- A febrile illness (i.e., temperature greater than 101.0 F [greater than 38.3 C]) characterized by bilateral diffuse interstitial edema that may radiographically resemble ARDS, with respiratory compromise requiring supplemental oxygen, developing within 72 hours of hospitalization, and occurring in a previously healthy person.
- An unexplained respiratory illness resulting in death, with an autopsy examination demonstrating noncardiogenic pulmonary edema without an identifiable cause.

Laboratory criteria for diagnosis

- Detection of hantavirus-specific immunoglobulin M or rising titers of hantavirus-specific immunoglobulin G, or
- Detection of hantavirus-specific ribonucleic acid sequence by polymerase chain reaction in clinical specimens, or
- Detection of hantavirus antigen by immunohistochemistry.

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Case classification

Confirmed: a clinically compatible case that is laboratory confirmed.

Presumptive: a clinically compatible case in an individual less than 35 years old who does not have a predisposing medical condition, and who has no laboratory test results, or who has non-specific laboratory results that are consistent with a diagnosis of HPS, e.g. hemoconcentration, left shift in the white blood cell count, neutrophilic leukocytosis, thrombocytopenia, and circulating immunoblasts.⁽⁵⁾

Comment

Laboratory testing should be performed or confirmed at a reference laboratory. Because the clinical illness is nonspecific and ARDS is common, a screening case definition can be used to determine which patients to test. In general, a predisposing medical condition (e.g., chronic pulmonary disease, malignancy, trauma, burn, and surgery) is a more likely cause of ARDS than HPS, and patients who have these underlying conditions and ARDS need not be tested for hantavirus.

Information Needed for Investigation

Verify the diagnosis. What laboratory tests were conducted? What were the results? What laboratory conducted the testing and what is their phone number? If laboratory tests were not done, are specimens available? What are the patient's clinical symptoms? What is the name and phone number of the attending physician?

Establish the extent of illness. Determine if household or other close contacts are, or have been, ill by contacting the health care provider, patient or family member.

Contact the Regional Communicable Disease Coordinator.

Case/Contact Follow Up And Control Measures


Determine the source of infection to prevent other cases:

- Did the case's occupation or hobbies expose him/her to frequent contact with rodents or rodent infested areas?
- Has the case visited or recently cleaned a vacation home or other seasonally opened dwelling?
- Have there been other cases linked by time, place or person?
- Was the case's home or nearby buildings rodent infested?
- Has the case recently travelled to areas endemic for hantavirus?

Control Measures

See the Control of Communicable Diseases Manual, Hantavirus Pulmonary Syndrome, "Methods of control."

See the Red Book, Hantavirus Cardiopulmonary Syndrome, "Control Measures."

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Laboratory Procedures

Specimens: ⁽⁴⁾

The Centers for Disease Control and Prevention (CDC) will accept specimens for testing if they are submitted through the State Public Health laboratory (SPHL). Instructions on the proper collection, handling, and shipping of specimens can be obtained from the Regional Communicable Disease Coordinator or from the SPHL web site at:

<http://www.dhss.state.mo.us/Lab/index.htm>. (8 May 2003)


Reporting Requirements

Hantavirus pulmonary syndrome is a Category I(A) disease and shall be reported to the local health authority or to the Missouri Department of Health and Senior Services within 24 hours of first knowledge or suspicion by telephone, facsimile or other rapid communication.

1. For confirmed and presumptive cases, complete a "Disease Case Report" (CD-1). Attach all laboratory results on specimens submitted.
2. **Contact the Regional Communicable Disease Coordinator immediately.**
3. For confirmed or presumptive cases complete the "Hantavirus Pulmonary Syndrome Case Report Form".
4. If specimens are to be sent to CDC for testing, complete the "National Surveillance Laboratory Specimen Form for Possible Cases of Hantaviral Pulmonary Syndrome".
5. Entry of the completed CD-1 into the MOHSIS database negates the need for the paper CD-1 to be forwarded to the Regional Health Office.
6. Send the completed secondary investigation form(s) to the Regional Health Office.
7. All outbreaks or "suspected" outbreaks must be reported as soon as possible (by phone, fax, or e-mail) to the Regional Communicable Disease Coordinator. This can be accomplished by completing the Missouri Outbreak Surveillance Report (CD-51).
8. Within 90 days from the conclusion of an outbreak, submit the final outbreak report to the Regional Communicable Disease Coordinator.

References

1. Chin, James, ed. "Hantavirus Pulmonary Syndrome." Control of Communicable Diseases Manual. 17th ed. Washington, DC: American Public Health Association, 2000: 234-236.
2. American Academy of Pediatrics. "Hantavirus Cardiopulmonary Syndrome." In: Pickering, LK, ed. 1997 Red Book: Report of the Committee on Infectious Diseases. 25th ed. Elk Grove Village, IL. 2000: 272-274.
3. Centers for Disease Control and Prevention. Case Definitions for Infectious Conditions Under Public Health Surveillance. MMWR 1997: 46 (No.RR-10). "Hantavirus Pulmonary Syndrome (HPS)," 1996, <http://www.cdc.gov/epo/dphsi/casedef/hantaviruscurrent.htm>. (8 May 2003)

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4. Centers for Disease Control and Prevention, Special Pathogens Branch, Division of Viral and Rickettsial Diseases: "Guidelines for Submitting Specimens to the Special Pathogens Branch," 2002. Found in this Manual or at:
<http://www.cdc.gov/ncidod/diseases/hanta/hps/noframes/phys/specimen/specguide.htm>. (8 May 2003)
5. Missouri Department of Health and Senior Services, Section for Communicable Disease Prevention - surveillance case definition.

Other Sources of Information

1. LeDuc, James W. "Hantaviruses." Viral Infections of Humans Epidemiology and Control; 4th ed. Eds. Alfred S. Evans and Richard A. Kaslow. New York: Plenum, 1997: 349,350,355,356.
2. Centers for Disease Control and Prevention, "Hantavirus-Technical Information Index,"
<http://www.cdc.gov/ncidod/diseases/hanta/hps/noframes/phys/technicalinfoindex.htm>. (8 May 2003)
3. The Merck Veterinary Manual. 8th Ed. Ed. Susan E. Aiello. Whitehouse Station, NJ: Merck & Co., Inc., 1998: 2180. <http://www.merckvetmanual.com/mvm/index.jsp> (search "hantavirus" or "hanta virus"). (8 May 2003)

Hantavirus Pulmonary Syndrome (HPS)

FACT SHEET

What is Hantavirus Pulmonary Syndrome?

Hantavirus pulmonary syndrome is a disease caused by a virus identified in 1993. This virus is called the Sin Nombre virus and belongs to a group of viruses with the collective name of “hantavirus.”

What are the symptoms of HPS?

The illness usually develops about one to three weeks following exposure and begins with a high fever, chills, and muscle aches. Within a few days, the illness can progress rapidly to serious respiratory distress and difficulty breathing. In the United States, about 44% of the reported cases have died. However, there is some evidence that milder forms of the illness may occur and might not have been diagnosed or reported.

How does exposure happen?

In the United States, deer mice (plus cotton rats and rice rats in the southeastern states and the white-footed mouse in the Northeast) are the rodents carrying hantaviruses that cause hantavirus pulmonary syndrome. A person can be exposed to the virus by breathing the dust caused by cleaning rodent droppings, disturbing the nests of the deer mouse, or by living or working in places infested with the deer mouse.

Can the virus be spread between people?

The type of hantavirus that causes HPS in the United States is not transmitted from one person to another.

How common is the disease?

The disease is not common and mostly occurs in the Western United States. However, the deer mouse is located throughout most of the United States, including Missouri. This disease is not known to occur in Missouri.

How can I protect myself and family from the disease?

First, avoid contact with rodents by keeping them out of your home and workplace. Plug holes or gaps larger than ¼ inch. Remove sources of food from around your home or business. Keep firewood, debris or other similar nesting sites as far from the home as possible. When cleaning up rodent droppings, avoid creating dust by wetting the droppings with a mixture of bleach and water. Do not use a vacuum cleaner or broom. Wipe up the droppings and place in a plastic bag. Wear rubber or latex gloves and use a dust/mist mask.

Where can I get more information?

For more information about the disease, controlling mice, and cleaning procedures contact your local public health agency or the Missouri Department of Health and Senior Services, Section for Communicable Disease Prevention toll free at 1-866-628-9891 or 573-751-6113.

Missouri Department of Health and Senior Services
Section for Communicable Disease Prevention
Phone: (866) 628-9891 or (573) 751-6113

Hantavirus Pulmonary Syndrome Case Report Form (Form Approved OMB 0920-0009)

Circle correct response.
Date form: mm/dd/yy
Unk = Unknown

Case-patient Identification
Number

-
FIPS- -
Year-

--	--	--	--	--	--	--	--

Case-patient's last name

First name

Middle name

Street Address

City

County

State

Zip

()
Home Telephone

Date of
birth:

Age:

Sex:

Male Female

/ /

Race:

White

Black

Asian/
Pacific
Islander

American
Indian/
Alaska
Native

Other:

Ethnicity:

Hispanic

Non-Hispanic

Unk.

Occupation:

Onset date: / /

Was patient
Hospitalized?

Yes

No

Unknown

Number of times hospitalized since onset of illness:

1st Hospitalization

2nd
Hospitalization

Name of
Hospital:

Location
of
Hospital: _____

Dates in
Hospital: ____/____/____ to ____/____/____ ____/____/____ to ____/____/____

Record
Number: _____

Did the patient have any of the following?

Fever >101 F or >38.3 C: Yes No Unk. Highest Fever: _____

Thrombocytopenia (platelets
150,000 mm³): Yes No Unk. Lowest platelet count: _____

Elevated Hematocrit (Hct): Yes No Unk. Highest Hct: _____

Elevated creatinine: Yes No Unk. Highest creatinine: _____

WBC: _____ Total Neutrophils: _____(%) Banded
Neutrophils: _____(%) Lymphocytes: _____(%)

CXR with unexplained
bilateral interstitial infiltrates
or suggestive of ARDS? Yes No Unk. Date: _____

Respiratory compromise
requiring supplemental
oxygen? Yes No Unk.

Oxygen saturation <90% at
any time? Yes No Unk.

Was the patient intubated? Yes No Unk. Date: _____

Has the patient received
ribavirin? Yes No Unk.

History of any relevant underlying medical conditions (i.e. COPD, malignancy,
immunosuppression, diabetes)?

Other possible explanations for acute illness (i.e. sepsis, burns, trauma)?

Outcome of illness?	Alive	Dead	Unk.	If deceased, date of death: ____/____/____
----------------------------	-------	------	------	--

Was an autopsy performed?	Yes	No	Unk.
---------------------------	-----	----	------

If yes, was exam compatible with non-cardiogenic pulmonary edema?	Yes	No	Unk.
---	-----	----	------

Are tissue specimens (fresh-frozen or paraffin blocks) available for testing?	Yes	No	Unk.
---	-----	----	------

Is serum/blood specimen available for testing for hantavirus infection?	Yes	No	Unk.
---	-----	----	------

Has a specimen been tested for hantavirus infection at another laboratory?	Yes	No	Unk.
--	-----	----	------

If yes, where?	Type of specimen?	Results (i.e. titer, OD)?
_____	_____	_____

History of any rodent exposure in 6 weeks prior to onset of illness?	Yes	No	Unk.
---	-----	----	------

If yes, date of contact: ____/____/____

Type of rodent:	Mouse	Rat	Other:	Unk.

Place of Contact (town, county, state): _____

Comment:

State Health Dept. reporting case:

State/local ID

Number: _____

Date form completed: ____/____/____

Person completing report: _____

Phone number: (____)____-____


Name of patient's physician:

Phone number: (____)____-____

Public reporting burden of this collection of information is estimated to average 20 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to CDC/ATSDR Reports Clearance Officer; 1600 Clifton Road NE, MS D-24, Atlanta, GA 30333; ATTN: PRA (0920-0009).Centers for Disease Control and Prevention
Revised August 2002

[\[Back to Specimen Submission Guidelines\]](#)

Special Pathogens Branch
Division of Viral and Rickettsial Diseases
National Center for Infectious Diseases
The Centers for Disease Control and Prevention (CDC)
U.S. Department of Health and Human Services

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Guidelines For Submitting Specimens to the Special Pathogens Branch, CDC

Serology:

The following specimen types may be submitted:

- Serum drawn near admission with clots retained from red top tube
- As late a serum as available
- Convalescent serum drawn approximately 21 days after first specimen
- Post-mortem heart blood

Specimen packaging requirements:

- Minimum volume: 1ml serum (2.5 ml preferred)
- Serum samples must be shipped with a cold pack, or on dry ice in a *plastic* tube.
- Clots and acute blood for virus isolation must be sent on dry ice in a *plastic* tube.

Immunohistochemistry (IHC):

The following types of formalin-fixed or paraffin-embedded tissues may be submitted:

- Lung, kidney, and spleen tissues are preferred.
- Other tissues that may be sent include lymph nodes, heart, pancreas, pituitary, brain, or liver.


Specimen packaging requirements:

- Paraffin blocks are preferred, particularly if death was not recent.
- If paraffin blocks are not available, formalin-fixed tissues may be sent.
- Ship paraffin blocks or formalin-fixed tissue at room temperature--do not freeze.
- An autopsy or surgical report must accompany these results.

PCR/Virus Isolation:

The following types of samples may be submitted:

- Ante-mortem: You may submit biopsy material of the lung or bone marrow aspirate or clot.

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- Post-mortem: spleen, lung, kidney, liver, lymph nodes, heart, pancreas, pituitary, brain, or liver tissue, or heart blood.

Specimen packaging requirements:

- Clots must be sent on dry ice in a *plastic* tube.
- Tissues should be at least 1cm³.
- Buffy coat and fresh tissues must be shipped on dry ice.

Notes

- NO specimens accepted without prior consultation. Call for mailing address (404 639 1510 or 404 639 1115).
- Send specimens by overnight courier (Federal Express preferred) and fax airway bill number and packing list to SPB at 404 639 1509 or 404 639 1118. International submitter should consider direct shipment with an airline to expedite arrival at CDC.
- Do not freeze glass tubes.
- Package in accordance with I.A.T.A. regulations to prevent leakage.

Here are two useful links for information on these regulations:

- International Air Transport Association (I.A.T.A.). While this site does not publish all regulations, information about them is posted under "Products and Services". <http://www.iata.org/index.htm> (8 May 2003)
- Office of Health and Safety, Biosafety Branch (OHS) at CDC, "Packaging and Shipping of Biomedical Material," at: <http://www.cdc.gov/od/ohs/biosfty/shipdir.htm> (8 May 2003)
- Label sample as diagnostic specimen and include the following information: your name, the patient's name, test(s) requested, date of collection, laboratory or accession number, and the type of specimen being shipped, a specimen submission form, and a case report form (for hantavirus testing only). The form is found in this Manual and at: <http://www.cdc.gov/ncidod/diseases/hanta/hps/noframes/phys/specimen/subform.htm>. (8 May 2003) On the outside of the box, specify how the specimen should be stored: refrigerated, frozen, or do not refrigerate.
- Subsequent shipments from outbreaks may require U.S. Public Health Service permits.

These guidelines can also be found on CDC's web site located at:

<http://www.cdc.gov/ncidod/diseases/hanta/hps/noframes/phys/specimen/specguide.htm> (8 May 2003)

National Surveillance Laboratory Specimen Form for Possible Cases of Hantaviral Pulmonary Syndrome

Diagnostic Specimen Submission Form

**CASE-PATIENT IDENTIFICATION
NUMBER:**

-
FIPS-

-
Year-

--	--	--	--	--	--	--	--

Case-Patient Name:

Last

First

MI

State Health Department Identifying Information:

Date Specimen(s) Received by State:

___/___/___

State Health Department Lab Submitting
Specimen(s):

Name of State Lab Person Shipping
Specimen(s):

State Health Department Dept Laboratory
Phone Number:

(____)_____-_____

Hospital Submitting Specimen(s):

Specimen(s) List: (circle specimen type)

1) Specimen ID Number:

Date Collected: ___/___/___

1 Serum

2 Tissue

A Paraffin

B Formalin

C Fresh frozen

3 Blood Clot

2) Specimen ID Number:

Date Collected: ____/____/____

1 Serum

2 Tissue

A Paraffin

B Formalin

C Fresh frozen

3 Blood Clot

3) Specimen ID Number:

Date Collected: ____/____/____

1 Serum

2 Tissue

A Paraffin

B Formalin

C Fresh frozen

3 Blood Clot

4) Specimen ID Number:

Date Collected: ____/____/____

1 Serum

2 Tissue

A Paraffin

B Formalin

C Fresh frozen

3 Blood Clot

LABEL ALL SPECIMENS WITH:

- 1) First and Last Name of Case-Patient
- 2) Case-Patient ID Number
- 3) State Laboratory Specimen ID Number
- 4) The Date the Specimen was Collected
- 5) Type of Specimen (e.g., lung, liver, heart, serum, etc).

On Outside of the Box Label How Specimen Should be Stored (i.e. refrigerate, frozen, do not refrigerate)

**Please send Case Report Form with this form and specimen(s).*

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Special Pathogens Branch
Division of Viral and Rickettsial Diseases
National Center for Infectious Diseases
The Centers for Disease Control and Prevention (CDC)
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